

CLAIMS

What is claimed is:

1. A tibial component of a knee prosthesis comprising:

a tray having top and bottom surfaces;

a keel having a top end and a bottom end, the keel being engageable with the bottom surface of the tray, the keel and tray forming a male/female junction; and

a rotational alignment pin extending from one of the tray and keel and a pin receiving bore located on the other of the tray and keel to facilitate aligning the tray and keel in predetermined relationship for assembly.
2. The tibial component of claim 1 wherein the rotational alignment pin prevents the junction from seating unless the rotational alignment pin is aligned with the pin receiving bore.
3. The tibial component of claim 1 wherein the male/female junction comprises a boss extending from one of the tray and keel and a boss receiving bore formed in one of the tray and keel, the boss and boss receiving bore being coaxial about a junction axis, the rotational alignment pin and pin receiving bore being coaxial about an alignment axis parallel to the junction axis.
4. The tibial component of claim 3 wherein the alignment pin and pin receiving bore are located within the male/female junction.
5. The tibial component of claim 4 wherein the boss extends downwardly from the bottom surface of the tray and the boss receiving bore extends downwardly from the top end of the keel.

6. The tibial component of claim 1 wherein the rotational alignment pin has a first portion extending away from one of the tray and keel and a second portion extending from the first portion further away from said one of the tray and keel, the second portion having a smaller cross sectional dimension than the first portion such that the second portion may be first received by the pin receiving bore when the tray and keel are not rotationally aligned.
7. The tibial component of claim 6 wherein the cross sectional dimension of the first portion is approximately equal to a corresponding cross sectional dimension of the pin receiving bore.
8. The tibial component of claim 6 wherein the rotational alignment pin is tapered between the first and second portions such that upon assembly of the male/female junction with the tray and keel out of rotational alignment, the second portion is received by the pin receiving bore and the taper contacts an edge of the pin receiving bore causing the tray and keel to rotate into rotational alignment upon further assembly of the junction.
9. A tibial component of a knee prosthesis comprising:
 - a tray having top and bottom surfaces;
 - a keel having a top end and a bottom end, the keel being engageable with the bottom surface of the tray, the keel and tray forming a male/female junction including a boss extending from one of the tray and keel and a boss receiving bore formed in the other of the tray and keel, the boss and the boss receiving bore being coaxial about a junction axis, the boss and the boss receiving bore having complimentary non-circular cross-sectional shapes perpendicular to the junction axis such that the boss and boss receiving bore form a positive

engagement that resists relative rotation about the junction axis once the junction is seated along the junction axis.

10. A method for implanting a modular tibial component into a knee, the method comprising:

providing separate, modular tibial tray and keel components forming a male/female junction, one of the tray and keel components having a rotational alignment pin extending from the component, the pin having a first portion extending away from one of the tray and keel and a second portion extending from the first portion further away from said one of the tray and keel, the second portion having a smaller cross sectional dimension than the first portion and a tapered portion between the first and second portions, the other of the tray and keel components having a pin receiving bore;

grossly aligning the tray and keel;

assembling the male/female junction so that the second portion is received by the pin receiving bore; and

allowing the tapered portion and first portion to align the tray and keel as the male/female junction is seated.

11. An instrument for gripping a tibial keel component of a modular keel and tray assembly, the keel component having a first end and a second end, the keel component being configured for insertion of the second end into a tibial bone, the instrument comprising:
- a handle; and

- an attachment mechanism for connecting the instrument to the keel such that the handle extends outwardly from the keel component to provide a grip for manipulating the keel component.
12. The instrument of claim 11 wherein attachment mechanism connects the instrument to the keel component in a reproducible known orientation such that the orientation of the handle indicates the orientation of the keel component even when the keel component is not itself visible.
13. The instrument of claim 11 wherein the attachment mechanism further comprises:
a first jaw attached to the handle; and
a second jaw attached to the handle, the jaws being movable relative to one another to clamp the keel component.
14. The instrument of claim 13 wherein the attachment mechanism further comprises:
an actuator;
a link connecting the actuator to the jaws, the actuator being movable to cause the jaws to move between a closed position in which they are relatively close together and an open position in which they are relatively further apart, the actuator, link, and jaws having a point of singularity beyond which further movement of the actuator results in the jaws locking onto the keel in the closed position.
15. The instrument of claim 11 further comprising a cover positionable over a portion of the keel component to shield the portion of the keel component from contamination while the keel component is manipulated into position.

16. The instrument of claim 15 wherein the cover is movable while the instrument is connected to the keel component between a first position in which the cover is positioned over the portion of the keel component and a second position in which the cover is positioned away from the portion of the keel component to expose the keel component.
17. The instrument of claim 16 wherein the cover is lockable in both the first and second positions.
18. The instrument of claim 11 wherein the attachment mechanism connects the handle to the first end of the keel component such that upon insertion of the second end of the keel component into the tibial bone, at least one of the attachment mechanism and handle abut the tibial bone and prevent the first end of the keel component from being fully inserted into the tibial bone.
19. An instrument for gripping a tibial tray component of a modular keel and tray assembly, the tray component having a top and a bottom, the tray component being configured for assembly to the keel component, the instrument comprising:
 - a handle; and
 - an attachment mechanism for connecting the instrument to the tray such that the handle extends outwardly from the tray component to provide a grip for manipulating the tray component.
20. The instrument of claim 19 wherein attachment mechanism connects the instrument to the tray component in a reproducible known orientation such that the handle indicates the orientation of the tray component even when the tray component is not itself visible.
21. The instrument of claim 19 wherein the attachment mechanism further comprises:

an adapter connectable to the handle and the tibial tray as an intermediate member
between the handle and the tibial tray component.

22. The instrument of claim 21 wherein the adapter is one of a plurality of adapters, each adapter connectable to the handle, and each adapter connectable to one of a plurality of differently configured tibial tray component such that a common handle can be used with a plurality of differently configured tibial tray components.
23. The instrument of claim 19 wherein the tibial tray component further includes a dovetail mating surface and the attachment mechanism further includes a complimentary dovetail mating surface for connecting the handle to the tibial tray.
24. The instrument of claim 19 wherein the attachment mechanism connects the handle to the tibial tray in torque transmitting relationship.
25. A disassembly tool for disassembling a modular tibial knee implant including a tibial tray component and a tibial keel component, the tibial tray component and tibial keel component forming a male/female junction between them, the tibial tray component having a bearing locking mechanism, the tool comprising:
- a longitudinal axis;
 - a first member engageable with the bearing locking mechanism in axial first force transmitting relationship;
 - a second member engageable with the first member in axial second force transmitting relationship;
 - a third member engageable with the tibial keel component in axial third force transmitting relationship, the third force opposing the first; and

a handle assembly engaging the second and third members, the handle assembly operative to move the second member relative to the third member along the axis to apply opposing forces to the first and third members to move the tibial tray component and tibial keel component out of male/female seating arrangement.

26. The disassembly tool of claim 25 wherein the bearing locking mechanism includes a tray dovetail surface on the tibial tray and the first member is a separate component from the second member having a complimentary dovetail surface matingly engageable with the tray dovetail surface, the second member being engageable with the first member after the first member is engaged with the tibial tray, the second member locking the first member in position on the tibial tray.

27. The disassembly tool of claim 25 wherein the first member is one of a plurality of first members each configured to engage one of a plurality of differently configured tibial tray components such that by selecting the appropriate one of the first members, a common second member, third member, and handle assembly may be used with differently configured tibial tray components.

28. An assembly tool for assembling a modular tibial knee implant including a tibial tray component, a tibial keel component, and a tibial stem extension component, the tibial tray component and tibial keel component forming a male/female junction between them and the tibial keel component and tibial stem extension component forming a male/female junction between them, the tibial keel component being positioned between the tibial tray component and the tibial stem component, the tool comprising:

a longitudinal axis;

a first member engageable with the tibial tray component in axial first force transmitting relationship;
a second member engageable with the tibial stem component in axial second force transmitting relationship, the second force opposing the first; and
a handle assembly engaging the first and second members, the handle assembly operative to move the first member relative to the second member along the axis to apply opposing forces to the first and second members to move the tibial tray component and tibial keel component into male/female seating arrangement.

29. The assembly tool of claim 28 wherein the second member passes through an opening in the tibial keel component in order to engage the tibial stem component.

30. A tibial keel holder and tibial tray holder combination, the tibial keel holder being engageable with a tibial keel component of a modular tibial implant and the tibial tray holder being engageable with a tibial tray component of a modular tibial implant, the tibial keel component and tibial tray component forming a male/female junction between them, the combination comprising:

a tibial keel holder including a first handle and an attachment mechanism for connecting the instrument to the tibial keel component in a reproducible known orientation; and

a tibial tray holder including a second handle and an attachment mechanism for connecting the instrument to the tibial tray component in a reproducible known orientation, the first and second handles forming a predetermined

angle between them to give a visual indication of tray-to-keel rotational alignment.

31. The combination of claim 30 wherein the proper tray-to-keel alignment is indicated when the first and second handles are parallel to one another.
32. The combination of claim 30 further comprising an assembly tool for moving the tibial tray component and the tibial keel component into male/female seating arrangement, the assembly tool being engageable with the tibial tray component and the tibial keel component while the tibial tray holder is holding the tibial tray.
33. The combination of claim 32 wherein the assembly tool passes through an opening in tibial tray holder to engage the tibial tray component and the tibial keel component while the tibial tray holder is holding the tibial tray.
34. A method for implanting a modular tibial component into a knee, the method comprising the steps of:
 - providing separate, modular tibial tray and keel components;
 - engaging the tibial keel component with a tibial keel holder;
 - forming an incision in the knee joint;
 - preparing the tibial bone to receive the components;
 - inserting the keel component through the incision and engaging it with the prepared tibial bone using the tibial keel holder to manipulate the keel component;
 - inserting the tray component through the incision and assembling it to the keel component in situ; and
 - closing the incision.

35. The method of claim 34 wherein the tibial keel holder has a handle that extends from the tibial keel component in a known orientation, the method further comprising the step of noting the orientation of the tibial keel holder handle to verify the tibial keel component orientation.
36. The method of claim 35 further comprising the steps of:
engaging the tibial tray component with a tibial tray holder, the tibial tray holder having a handle that extends from the tibial tray component in a known orientation; and
comparing the orientation of the handles of the tibial tray holder and the tibial keel holder to verify the alignment of the tibial tray component relative to the tibial keel component.